The Foot and Lower Leg

As a nail tech, it is common that clients will expect you to offer treatments for feet and/or toes. You must understand the anatomy and physiology of these areas in order for you to do so. The following diagram shows the most important "landmarks" of the lower leg from the knee area to the tendons in the top of the feet. You will be tested on this at the end of the module.

Nail Technology Theory Foundation - Anatomy & Physiology of the Hands & Feet

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4 Pes Anserinus attachment site	5 Gastrocnemius	6 Tibialis Anterior
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10 Medial Malleous	11 Tibialis anterior Tendon	12 Extensor digitorum longus tendons

The Bones of the Lower Leg

The popliteal fossa is the delicate area on the posterior aspect of the knee. The bones in this diamond shaped are the femur and tibia. There are also nerves and vessels which make it an area which we must be mindful of. Massage is not done on this area, the massage therapist will glide over it without any pressure. Pedicurists do not touch the popliteal fossa, but we must offer supportive seating and cushioning for our clients', so they are comfortable throughout their treatment.

The patella is the "kneecap" and is a piece of bone surrounded by proximal fluid on the anterior aspect. The knee, or tibiofemoral joint, is made up of the distal femur and proximal tibia and is a synovial joint. This is a joint that is filled with fluid, where bones move against each other. Other synovial joints are the hip, elbow and shoulder. Synovial fluid is a similar consistency to egg white.

The bones of the lower leg are the tibia and fibula. The tibia is the largest of the two, and the proximal part of the tibia forms part of the knee joint and runs to the ankle. It is easy to feel through the skin as it sits superficially and is flat. The fibula is deep inside the surrounding muscles and bears around 10% of our body weight. It is also the thinnest bone in the body in proportion to its length. The shaft of the tibia runs from the tibial tuberosity to the medial malleolus.

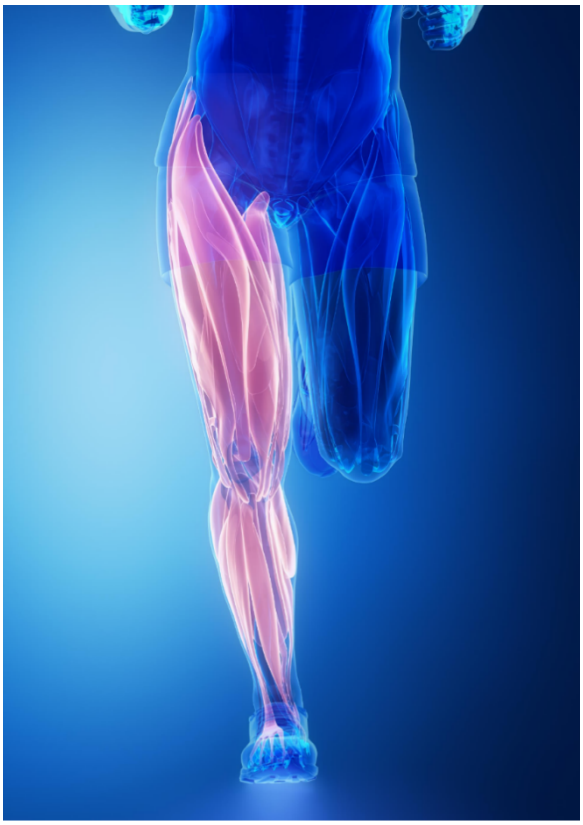
The tibial tuberosity is a superficial knob which is around 1.5cm in diameter. It is the attachment site for the patellar ligament and can sometimes protrude visibly. This can cause problems when kneeling and can be quite sensitive.

The Pes anserinus (which means "goose foot") attachment site is the flat area next to the tibial tuberosity, towards the inside of the knee. This area is where we have a convergence of the three tendons of the thigh, and they form the pes anseriunus tendon. This attaches at the proximal, medial shaft of the tibia – the top end of the tibia, nearer the midline of the body.

The lateral and medial malleolus are easy to see as they are the obvious knobs of the ankle. The lateral malleolus is on the outside of the ankle, at the distal fibula where it is visibly pointy and sticks out more than the medial malleolus. The medial malleolus is the distal end of the tibia. Malleous means hammer, can you see the reason for this name?

Muscles of the lower leg

As you can see from this image, there are a lot of muscles in our legs. These work synergistically to give us a complete range of movement and abilities.



Just like our arms, we have a number of muscles in our legs. These can be divided into 4 groups. These are:

1. Calf muscles – the large calf muscle, the "meaty" portion of our calf area, is the gastrocnemius. We also have the soleus which sits under the gastrocnemius.
2. The peroneus longus and peroneus brevis are located on the little toe side of the lower leg, just below the knee line.
3. Extensors of the ankle and toes enable us to extend our feet and toes and are layered together on the front of the leg and the top of the foot – these are the tibialis anterior, extensor digitorum longus and the extensor hallucis longus.
4. Flexors – in the ankle and toes we have small flexors. These are deep within the muscle network of the gastrocnemius and soleus on the back of the leg. The small flexors include the tibialis posterior, flexor digitorum longus and flexor hallucis longus.

The actions of our legs and feet include:

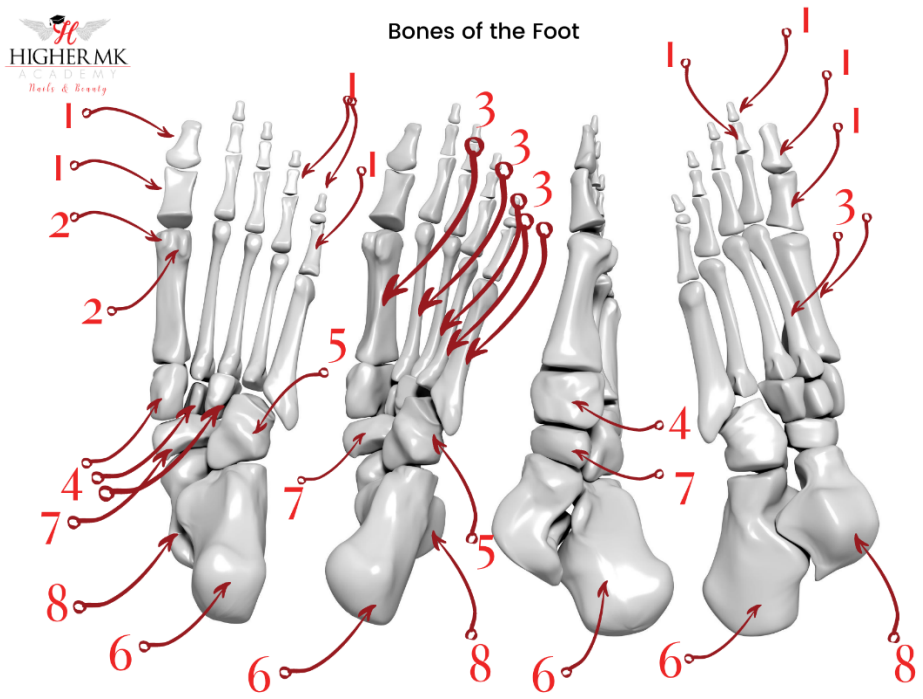
- Plantar flexion – lifting of the heel onto our toes – this takes 8 muscles working together

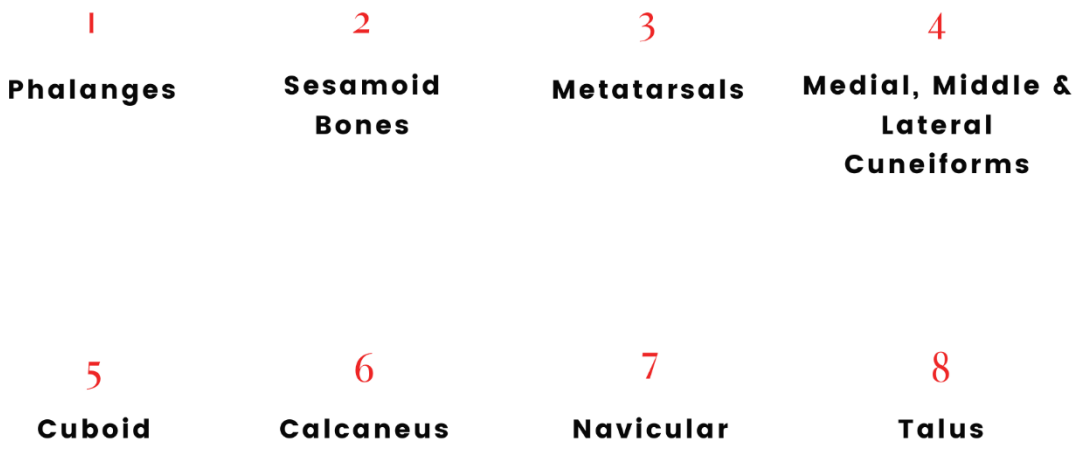
- Dorsiflexion – pulling our toes towards our midline, stretching the backs of our legs in the process. This is the job of 3 muscles.

Other actions of the foot include inversion, eversion, extension and flexion of the 2nd to 5th toes.

The bones of the foot

Remarkably, the foot contains 26 bones – 2 in the heel, 5 in the midfoot arranged similarly to our wrist bones, the forefoot contains the 5 metatarsals and the 14 phalanges. Our big toes consist of 2 phalanges, the rest of our toes have 3 each. Our metaTARSALS have a proximal base, a shaft and a distal head just like the metaCARPALS in our hands.





The large, solid calcaneus is the heel of the foot. You can feel the bone even though it sits underneath the tendons. The curve of the heel of the foot is the tuberosity of the calcaneus and the calcaneus tendon attaches to the top (superior aspect) of the bone.

The talus is found at the distal ends of the tibia and fibula, and it has a head, neck, trochlea and lateral tubercle. The trochlea is the most prominent part of the talus.

Between the talus and the cuneiforms is the navicular, the “boat” or bean shaped bone, which is the attachment for the tibialis posterior and the spring ligament.

Next to the navicular and the lateral cuneiform on the little toe side, behind the 4th and 5th metatarsals, is the cuboid. It is covered by the extensor digitorum brevis muscle. The cuboid is not easy to find as only a small portion is accessible.

The cuneiforms are cube shaped bones situated between the navicular, talus and metatarsals. These are called the medial, middle and lateral cuneiforms and the medial cuneiform is where the tibialis anterior and tibialis posterior muscles attach.

The first metatarsal is thicker than the other metatarsals and its proximal end is next to the medial cuneiform. This ridge can be visibly prominent and even irritated by tight footwear.

All the metatarsals have wider bases and heads and a curved shape. The 2nd to 5th metatarsal are long and slender compared to the 1st metatarsal. The 5th or little toe metatarsal has a

tuberosity at its proximal end which serves as an attachment site for the peroneus brevis. It is quite easy to locate if you slide your fingers from the base of your little toe along the outside edge of your foot towards the ankle.

The hallucis is formed of the two phalanges of the “big toe” and is covered in ligaments. The formal name for the big toe is the hallux.

All our other toes have 3 phalanges and these each have 2 joints – the Proximal InterPhangeal or PIP joint and the Distal InterPhangeal or DIP joint.

Our toes lose their grasping ability over time once we start to wear shoes more. Babies have a significantly greater grasping capability than adults, but this isn’t true to all humans. In cultures that don’t wear shoes, they retain the ability to use their toes for intricate tasks such as sewing and threading needles! Humans are also the only primate without a grasping big toe.